RF POWER LABS

220-10

CARNEL LABS CORPORATION

OPERATIONS & INSTRUCTION

MANUAL

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INSTRUCTION MANUAL

MODEL

220-10

WIDEBAND

POWER AMPLIFIER

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7-96-008-001

MODEL 220-10

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SECTIONS 1.0
GENERAL INFORMATION

1.1 SCOPE

This instruction manual describes the RF POWER LABS, INC. medium power, broadband RF power amplifier identified as Model 220-10. The manual includes principles of operation, operating instructions, detailed equipment description, adjustment procedures and appropriate schematics and diagrams for maintenance and servicing.

1.2 EQUIPMENT DESCRIPTION

The 220-10 amplifier is intended for use in applications which require approximately 35dB of power gain over a wide range of frequency at power outputs of from 10 to 20 Watts. The 220-10 will supply 10 Watts continuous over the entire band and 20 Watts over most of the band on an intermittent basis.

This amplifier derives its usefulness through provision of linear amplification of low-level signals over an extremely wide range of frequencies without frequency discrimination. Any signal within the specified bandwidth will be amplified - AM, FM, CW, SSB, Pulse - and delivered to the load at a power level determined by the gain of the amplifier and the level of the input signal.

A minimum gain of 37dB was selected in order to permit usage of the standard laboratory signal generators as signal sources, thus obviating the need for additional expensive signal generating devices for use with amplifiers.

The 220-10 is virtually immune to damage due to load mismatch. The system can operate indefinitely into an open circuit without harmful effects, other than possible damage to the front panel power meter due to being pegged. Nonetheless, excessive mismatch should be avoided as a matter of course.

1.3 EQUIPMENT SPECIFICATION

The specifications for the 220-10 amplifier are as follows:

FREQUENCY RANGE	:	10KHz to 230MHz
POWER GAIN	:	37dB Minimum
BANDPASS FLATNESS	:	± 1.5dB Typical
GAIN CONTROL, COURSE	:	42dB in 1.0dB steps
GAIN CONTROL, FINE	:	300 degrees rotation for 1.0dB approximately
INPUT IMPEDANCE	:	50 Ohms nominal
OUTPUT IMPEDANCE	:	50 Ohms nominal
POWER OUTPUT	:	10 Watts continuous up to 20 Watts intermittent at most frequencies (a slight power drop may be noticed at 230MHz)
OUTPUT VOLTAGE	:	60 Volts P-P into 50 Ohms 100 Volts P-P into 200 Ohms
DUTY FACTOR	:	100 Percent
DISTORTION	:	All harmonics are down greater than 17dB at 10 Watts (for frequencies above 130MHz, harmonics are down greater than 30dB at 10 Watts)
THIRD ORDER INTERCEPT	:	+ 52dBM
RISE TIME	:	5 Nanoseconds
MISMATCH PROTECTION	:	No damage for continuous operation at VSWR of 4:1; will operate into an open circuit without damage under full power conditions for short periods of time (NOTE: Open circuit operation should be avoided!)

SHORT CIRCUIT PROTECTION	:	Can withstand short circuits under full load without damage.
METER CIRCUIT	:	Calibrated in Watts for 50 Ohm loads.
METER ACCURANCY *	:	± 1dB
TYPES OF SIGNALS	:	The amplifier will faithfully reproduce any AM, FM, CW, SSB, PULSE, or complex wave at its output with minimum distortion.
CONNECTORS	:	BNC input and output - Front panel mount **
DIMENSIONS	:	Bench - 17.5 x 17.5 x 5.25(H) inches. Rack - 19(W) x 17.5 x 5.25(H) inches
WEIGHT	:	35 pounds
PRIMARY POWER REQUIRED	:	115/230 Volts at 50/60 cycles

*Front panel meter omitted when 220-10 is used as a driver in higher power systems.

**Output connector on rear panel when used as driver in higher power systems.

SECTION 2.0
PRINCIPLES OF OPERATIONS

2.1 GENERAL THEORY

The Model 220-10 is a distributed amplifier. In general, distributed amplifiers are comprised of a series of distributed amplifier modules served by a common DC power supply. All stages have their vacuum tubes arranged such that their input capacitances form the shunt capacitance of an artificial transmission line.

A signal propogating along the input line will feed each successive grid with a signal which is increasingly delayed in time. Thus the signals appearing at the plate as a result of the grid excitation will be similarly delayed.

For signal propogating in the forward direction in the plate line, there will be signal addition if the phase shift in the plate line is the same as the phase shift in the grid line per section. The signal appearing at the output terminal is the sum of the forward propogating signals generated by each of the tubes along the line.

It should be noted that part of each tube's output signal will travel the "wrong way" on the plate line. Therefore, each line is terminated at the reverse end by a resistive load equal to the characteristic impedance of the line, which is basically determined by the tube and circuit capacitance of the bandpass desired. In this way there is no reflection from the far end of the transmission line. The reverse propogating signal in the plate line does not build up in amplitude, but arrives in random phase dependent on the frequency and is absorbed in the reverse termination.

Therefore, the distributed amplifier, by distributing the tubes along these two transmission lines, essentially operates the tubes in parallel so far as their ability to generate current into a load is concerned, but splits up the capacitance so that they do not similarly add and thereby hold the gain bandwidth factor constant. It is thus possible to build an

amplifier having a gain-bandwidth in excess of the gain-bandwidth product of the individual tube used.

2.2 DETAILED OPERATION

The Model 220-10 system is comprised of one preamplifier and two distributed amplifier sub-assemblies, one dual voltage regulator and bias supply assembly, and a detector module.

The signal present at the input connector is fed through the 42dB STEP ATTENUATOR mounted to the front panel where the proper level is selected.

The adjusted level is now fed to the all solid state A1 ASSEMBLY which consists of voltage amplication. Q2 and Q3 are frequency compensated with the use of RLC feedback and emitter capacitors. Total gain is 18-20dB. Thus, there is a total power gain of 20dB delivered from the A1 ASSEMBLY to the input of the A2 ASSEMBLY, a ten tube stage arranged in a DA configuration for 10dB of power gain.

The A2 ouput is fed to the input of the A3 ASSEMBLY consisting of two parallel 12 tube DA stages. These two stages are paralleled to bring the natural plate line impedance of 100 Ohms down to 50 Ohms, thus giving the instrument an additional 3dB power output capability boost. The gain of this final assembly is about 11dB. The two parallel stages consisting of 24 tubes are mounted on one common circuit board for ease of wiring and trouble shooting.

The A4 ASSEMBLY is the Power Supply and Bias Regulator board. Its function is to provide regulation and adjustment control over the B+ and bias voltages.

The A5 ASSEMBLY is the RF Sampling Detector Board. It is located at the output of the amplifier where it samples and detects a small amount of the output signal. The DC output is connected to the WATTMETER located on the front panel. The accuracy of the meter is $\pm$ 1.0dB and should be used for reference readings only. The meter is not an absolute power meter and should not be used for exact power reading. Also, the user may notice that the meter is sensitive to VSWR on the line. Since this meter has been calibrated into 50 Ohms, any VSWR on

the line or any load other than 50 Ohms will render it inaccurate. Furthermore, only CW signals can be measured accurately. It is not suitable for measurement of PULSE, AM, etc.

NOTE: If the 220-10 system is used as a driver in a higher power model, the wattmeter will be omitted.

OPERATION INSTRUCTIONS

INSTALLATION NOTES

A visual inspection of the 220-10 should be made upon receipt of the equipment prior to putting it into service. Access to the unit is by virtue of removing the top cover panel. The system should be checked for loose tubes and other components and any internal or external damage should be reported immediately.

Rack mounted cabinets require support from the rear or side of the rack enclosure. Simple angle brackets will serve this purpose well. Under no circumstances should an attempt be made to support the unit by the rack panel alone.

COOLING

The top cover panel must be in place in order for the cooling system to function properly. Since the cooling is dependent upon the free flow of cooling air in through the rear and out through the sides, care should be taken to keep the rear and the sides free of any type of objects which might obstruct the free flow of air.

SAFETY CONSIDERATIONS

With the top cover panel removed and the line power applied, there are potentially dangerous voltages exposed. Only qualified technical personnel should be allowed access to the equipment under these type of conditions.

CONNECTING POWER

The 220-10 is designed to work with either 115 Volt or 230 Volt 50/60 cycle power, single phase. System performance will be degraded, if significantly different supply voltage is used. Check to be sure which of these voltages your amplifier is wired to accept.

FRONT PANEL CONTROLS AND INDICATORS
ATTENUATOR & GAIN ADJUST

The 220-10 requires no adjustments, however, the front panel attenuator (which adjusts the signal applied to the first stage) and the gain adjust (which adjusts the bias of the driver state), are provided as an operating convenience to permit setting output power level for a given input signal level.

The attenuator is ideal for coarse (1.0dB steps) calibrated gain adjustments and the gain adjust for precision or vernier gain adjustments (300 degree rotation for 1.0dB). Together they afford a gain control range of 43dB.

WATTMETER

The wattmeter is calibrated into 50 Ohms and will read within $\pm$ 1.0dB accuracy with the amplifier terminated into a 50 Ohm load. It is not sufficiently accurate to read exact power levels and it is susceptible to VSWR on the line. It is intended as an operational aid to make referene readings only.

PLACING EQUIPMENT IN SERVICE

With a nominal 50 Ohm resistive load and an input signal appropriate to produce a power output within the limitations specified above, the unit may be placed in operation without complication. The interrupt output, simply interrupt the input signal or increase input attenuator setting to produce commensurate output level reduction. The amplifier may be run indefinitely at rated output.

In setting up a system using the 220-10 as a power source, care should be exercised to avoid running the amplifier into an open circuit with a signal applied to the input since it is possible to damage the wattmeter by pegging it even though no damage will be done to the amplifier itself. Injecting 20 to 30dB of attenuation through the panelmounted attenuator will have the desired effect of lowering the output under a no-load condition such that the meter will not peg.

SERVICING INSTRUCTIONS

TUBE REPLACEMENT

Like all other electronic equipment, the 220-10 amplifier should undergo periodic performance checks in order that small breakdowns are detected before they become major repair problems.

The amplifier should not require any adjustments other than occasional replacement of a tube. Due to the unique distributed amplifier design approach, failure of one or more tubes may not necessarily affect the performance of the amplifier except for a small loss in gain and power output, or possible an increase in bandpass ripple.

Should any of these problems become evident, it is suggested that all of the tubes be checked with a good transconductance type tube tester. Any questionable tubes should be replaced with Raytheon type 6AN5 tubes only for maximum performance. Differences in grid lead inductances are known to exist between tubes of different manufacture.

ALIGNMENT

The bandpass and gain can be checked by using a good 10KHz to 250MHz sweep generator, a 50 Ohm detector, and a scope. The GAIN ADJUST is set for maximum (fully clockwise) and the STEP ATTENUATOR is set for zero (0) attenuation. Caution must be exercised so as to not drive the amplifier with too much signal otherwise the detector could be damaged.

The bandpass should be flat up to 230MHz within $\pm$ 1.0dB and the total gain should be 37dB minimum. If these values are not obtained, it is suggested that the B+ be checked at pin 12 of the A4 ASSEMBLY for +145 Volts $\pm$ 6 Volts. The current should be 1.5 amps $\pm$ 200 milliamps. This measurement can be made by reading the voltage drop across R8 on the A4 ASSEMBLY (pin 14 to pin 15). The reading should be -15 Volts $\pm$ 2 Volts. The low voltage regulator for the A1 ASSEMBLY should put out +23 Volts $\pm$ 1 Volt as measured from A4 pin 3 to ground. Bias voltage for the A3 ASSEMBLY should be - 7 Volts $\pm$ 1 Volt between A4 pin 7 and ground. Bias voltage for the A2 ASSEMBLY should be adjustable with the front panel GAIN ADJUST from -6.5 to -8.5 Volts $\pm$ .5VDC as measured at the arm of the GAIN ADJUST. ALL filaments (pin 4 on all tube sockets) should read

6.3 Volts AC ± 0.3 Volts AC. Screen voltages on all tubes (pin 6 on all tube sockets) should read + 140 Volts ± 5 Volts.

If all of these checks prove positive, it can be assumed that the power supply regulators are not responsible for the problem. It now becomes a simple and straight forward trouble shooting job accomplished by checking gain and bandpass for A1, A2, A3, in that order. Power and signal connectors are used on the assemblies to simplify this test.

Usually the problem of low gain and low power output can be corrected by checking and replacing some weak or defective tubes.

FUSE REPLACEMENT

If the fuse should let go, the cause should be found before the fuse is replaced. The over-current condition is an abnormality and simple fuse replacement and will not remedy the problem.

COOLING

The amplifier modules and DC regulators are cooled by forced air from two 100 CFM fans which should require no lubrication for the lifetime of the fan. Do not operate the instrument for any prolonged period of time with the top cover panel removed since it is needed for proper air circulatin. Without it the air pressure could fall dangerously low causing overheating and subsequent equipment damage.

220-10 DRIVER AMPLIFIER - FINAL ASSEMBLY (250-1139)

REFERENCE	QTY	DESCRIPTION	PART NUMBER
	1	Cabinet	250-4003
	1	Panel, Rear	250-4001
	1	Cover, Top	250-4405
	1	Panel, Front	250-4147
B1,2	2	Blower	260012
	2	Finger Guard	110009
	2	Spacer, Blower	250-4054
	1	Line Cord	600001
	1	Strain Relief	690003
	2	Fuseholder	510001
F1	1	Fuse, 8A, AC - 115V	510019
F1	1	Fuse, 4A, AC - 220V	510006
F2	1	Fuse, 3A, DC	510023
	1	Heatsink, Q5 Mtg.	460001
Q5	1	Transistor, MJ11030	480001
T1	1	Transformer	250-2001
C1	1	Capacitor, 1300uF/250V, Elec.	150001
K1	1	Relay, 115V	450001
K1	1	Relay, 220V	450012
	1	Clamp, Capacitor	250-4005
	1	Heatsink, Q7 Mtg.	460002

220-10 DRIVER AMPLIFIER - FINAL ASSEMBLY 250-1139 cont'd

REFERENCE	QTY	DESCRIPTION	PART NO.
Q7	1	Transistor, 2N3055	480002
	4	Spacer, Regulator Mtg.	250-4501
BR1	1	Bridge, Rectifier	490011
E4	1	Terminal, Teflon	400003
	1	Attenuator	520004
1	1	Potentiometer, 1K ohm	440001
	1	Knob	240001
SW1	1	Switch, Power	520019
IN/OUT	2	Connector, BNC	210011
R3	1	Resistor, 24K ohm, 2W	470005
R5	1	Resistor, 3.9K ohm, 1/2 W	470004
A2,3	2	Connector, 5 Pin	210002
	6	Connector, BNC Cable Assembly	210015
A1	1	Input Amplifier Assembly	250-1001
A2	1	Driver Amplifier Assembly	250-1002
A3	1	Output Amplifier Assembly	250-1003
A4	1	Regulator and Bias Board Assy.	250-1004
	1	Resistor, 100 ohm, 1W	470003

2	Bead, Ferrite	380011

220-10 DRIVER AMP - FINAL ASSEMBLY cont'd

REFERENCE	QTY	DESCRIPTION	PART NO.
	1	Bead, Ferrite	380025
	1	Bead, Ferrite	380008
	3	Lug, Terminal, Forked, Yellow	400008

INPUT AMPLIFIER - A1 ASSEMBLY (250-1001)

REFERENCE	QTY	DESCRIPTION	PART NUMBER
R1,9,14,16	4	Resistor, 22 ohm, 1/4 W, 5%	470050
R2,3	2	Resistor, 51 ohm, 1/4 W	470049
R4	1	Resistor, 120 ohm, 1/4 W	470062
R5,10,17	3	Resistor, 2.4K, 1/4 W	470145
R6,7,11,18	4	Resistor, 200 ohm, 1/2 W	470054
R8	1	Resistor, 33 ohm, 1/4 W	470142
R13	1	Resistor, 15 ohm, 1/4 W	470135
R15	1	Resistor, 200 ohm, 1 W	470149
R19,20	2	Resistor, 12 ohm, 1/2 W	470055
R21	1	Resistor, 680 ohm, 1/4 W	470146
R22	1	Resistor, 510 ohm, 1/4 W	470012
C1,2,3,5,6 9,10,11	8	Capacitor, 10uF/50V, Elec.	150007
C4,7	2	Capacitor, Variable 402	150061
C8	1	Capacitor, Variable 424	150077
C13	1	Capacitor, .001uF	150131
L1,4	2	Inductor, .22 uH, Molded	700003
L2	1	Inductor, 2.7 uH, Molded	700010

INPUT AMPLIFIER - A1 ASSEMBLY (250-100) Cont'd

REFERENCE	QTY	DESCRIPTION	PART NUMBER
Q1,2,3,4	4	Transistor, 2N3866	480003
	1	PC Board	250-6014
	1	Chassis, Mtg.	250-4083
	4	Spacers	690083
	4	Heatsink, Transistor	460005
	4	Pad, Transistor	460007
	2	Connector, Jack, Phone	210084
	2	Washer, Fiber	690104
	2	Connector, Tab, PCB Mount	400039

DRIVER AMPLIFIER - A2 ASSEMBLY (250-1002)

REFERENCE	QTY	DESCRIPTION	PART NUMBER
	1	Chassis	250-4006
	2	Cover, Side	250-4007
J1,2	2	Connector, BNC	210004
J3	1	Connector, 5 Pin	210003
PCB	1	PC Board	250-6002
	10	Socket	220001
V1-10	10	Tube	570001
L12-16, L18-22	10	Coil, Grid Line	250-3501
L2-10	9	Coil, Plate Line	250-3502
C14,17	2	Capacitor, 12uF/250V	150012
C13,16	2	Capacitor, 6.8uF/50V	150007
C15	1	Capacitor, .01/1KV	150016
C2	1	Capacitor, 200uF/200V	150013
C1	1	Capacitor, .1uF/200V	150014
C18	1	Capacitor, .01uF/50V	150032
C3-12	10	Capacitor, 1000pF, Unmolded Disc	150103
R4	1	Resistor, 75 ohm, 1/2 W	470010
R1,3	2	Resistor, 300 ohm, 2W	470147
R2	1	Resistor, 15 ohm, 2W	470057
L1	1	Coil, End	250-3503

DRIVER AMPLIFIER - A2 ASSEMBLY Cont'd

REFERENCE	QTY	DESCRIPTION	PART NUMBER
L11	1	Coil, End	250-3504
L17	1	Choke, 2.5uH	700005
	6	Terminal	400003
	2	Spacer, 5/8"	690077
	2	Clamp, Cable, 3/8"	690017
	1	Rod, Ferramic, 1/2"	380006

OUTPUT AMPLIFIER - A3 ASSEMBLY (250-1003)

REFERENCE	QTY	DESCRIPTION	PART NUMBER
	L	Chassis	250-4010
	2	Cover, Side	250-4011
J1,2	2	Connector, BNC	210004
J3	1	Connector, 5 Pin	210003
R1,5	2	Resistor, 100 ohm, 10W	470154
R2,6	2	Resistor, 15 ohm, 2W	470057
R3,4	2	Resistor, 100 ohm, 1W	470003
V1-24	24	Tube, 6AN5	570001
L15-26, L29-40	24	Coil, Grid Line	250-3505
L3-13, L42-52	22	Coil, Plate Line	250-3506
L2,41	2	Coil End	250-3507
L14,53	2	Coil End	250-3508
C18	1	Capacitor, .01/1KV, Disc	150016
C20,21,34,35	4	Capacitor, 2uF/200V,	150013
C1,3	2	Capacitor, 1uF/200V, Paper	150085
C16	1	Capacitor, 6.8uF/50V, Elec.	150007
C2,36,39	3	Capacitor, 12uF/250V, Elec.	150012
C4-15	12	Capacitor, 1000pF, Unmolded Disc	150103
C22-33, 37-40	16	Capacitor, .001uF, Disc	150131
	2	Choke, 7 5/8"	
	14	Terminal	400003

OUTPUT AMPLIFIER - A3 ASSEMBLY Cont'd

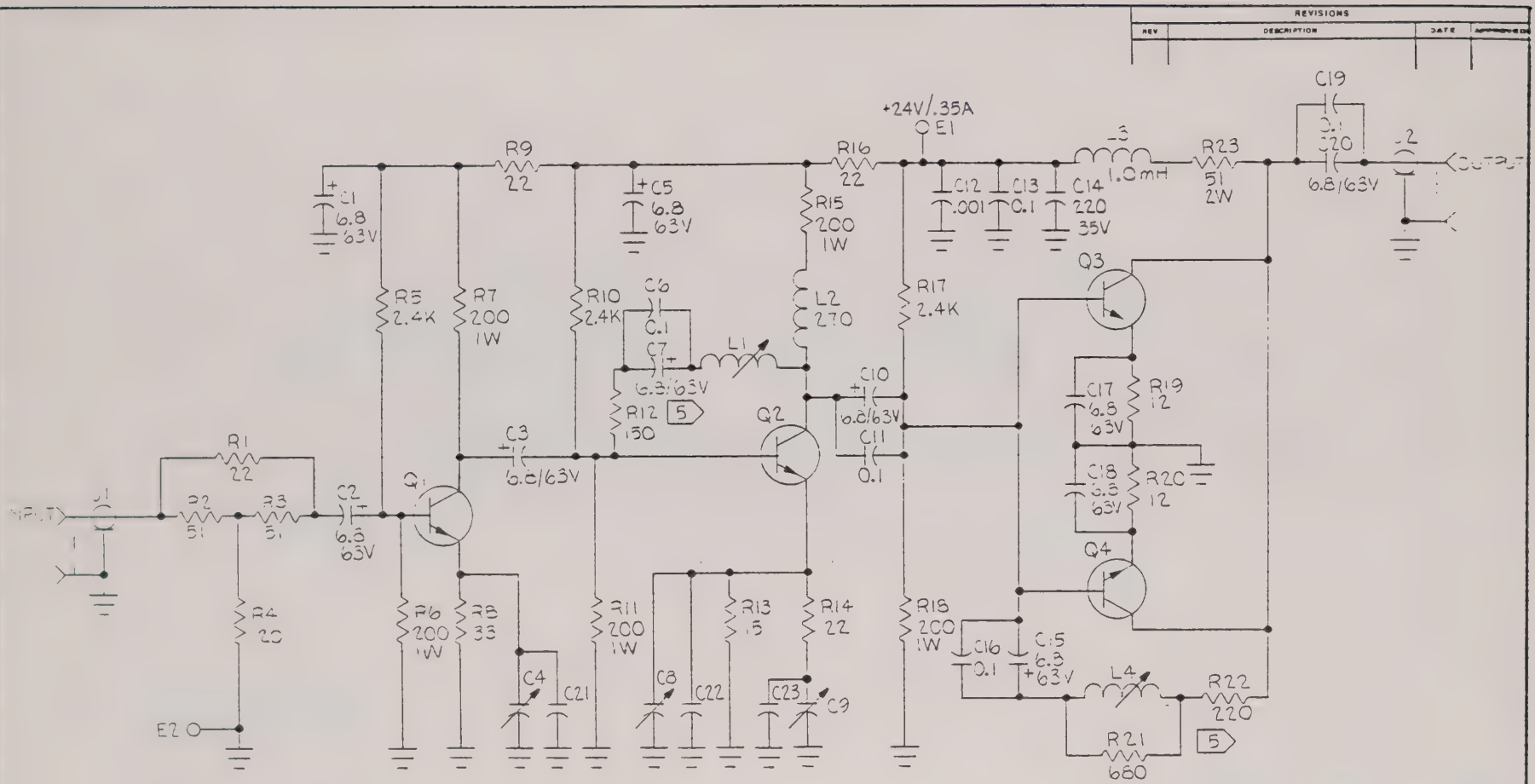
REFERENCE	QTY	DESCRIPTION	PART NUMBER
	1	PC Board	250-6005
	22	Socket, Tube	220001
	6	Clamp, Cable	690017
	3	Spacer, Uninsulated, 1/2"	
	2	Rod, Ferramic, 1/2"	380006

REGULATOR AND BIAS BOARD - A4 ASSEMBLY (250-1004)

REFERENCE	QTY	DESCRIPTION	PART NUMBER
PCB	L	PC Board	250-6003
ST3	1	I.C. Socket	220003
	15	Terminal	400032
R24	1	Potentiometer, 1K	440009
R34	1	Potentiometer, 25K	440010
	1	Socket	220004
Q6	1	Transistor, 2N2905	480006
VR2	1	Integrated Circuit	310001
C12	1	Capacitor, 220uF/100V	150029
C13	1	Capacitor, 100uF/150V	150030
C1	1	Capacitor, 100uF/250V	150013
C8,10	2	Capacitor, 470uF/150V	150020
C6,7,9	3	Capacitor, 220uF/35V	150078
C22	1	Capacitor, .05uF/50V	150033
CR20	1	Diode, Zener, 1N751A	490004

REGULATOR AND BIAS BOARD - A4 ASSEMBLY Cont'd

REFERENCE	QTY	DESCRIPTION	PART NUMBER
CR14	1	Diode, Zener, 1N759A	490005
CR17	1	Diode, Zener, 1N758A	490006
CR1	1	Diode, 1N3011	490057
CR11,12,13, 15,16,18,19	7	Diode, 1N4002	490009
R25	1	Resistor, 3K ohm, 1/2 W	470027
R32,36	2	Resistor, 10K ohm, 1/2 W	470030
R23	1	Resistor, 120 ohm, 1/2 W	470031
R35	1	Resistor, 4.7K ohm, 1/2 W	470028
R28	1	Resistor, 150 ohm, 1/2 W	470033
R27	1	Resistor, 300 ohm, 1/2 W	470034
R8	1	Resistor, 10 ohm, 50 W	470035
R4	1	Resistor, 5.6K, 2 W	470047
R5	1	Resistor, 24K, 2 W	470005
	1	Standoff, Feedthru, Red	400036
C1	1	Capacitor, 12 uF/250V	150023
R26	1	Resistor, 220 Ohm, 1/2 W	470029
R33	1	Resistor, 1.5K Ohm	470025
R37	1	Resistor, 1K, 2W	470174



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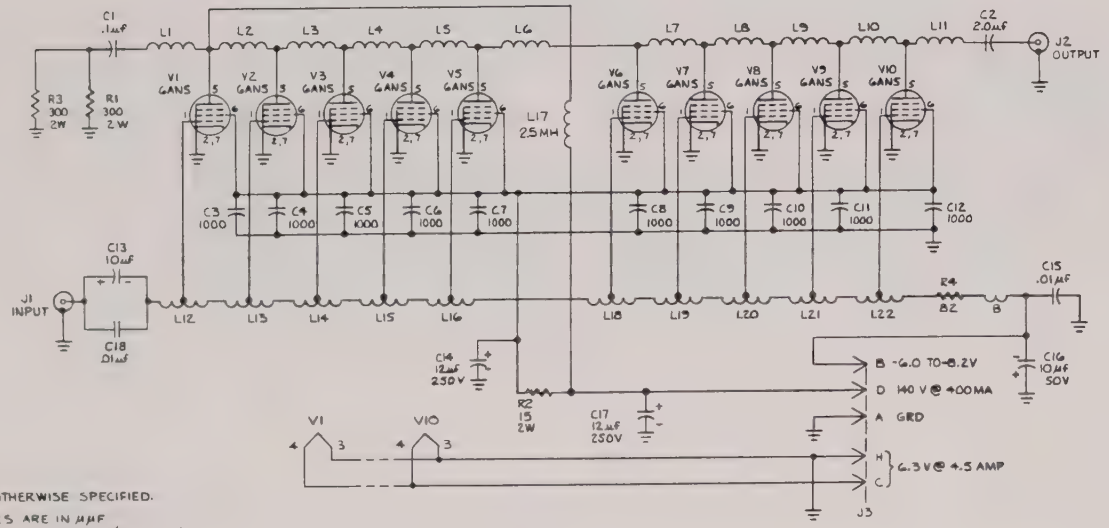


NOTES: UNLESS OTHERWISE SPECIFIED.

1. ALL CAPACITORS ARE IN μμF
2. ALL RESISTORS ARE IN OHMS, 1/2W, ±5%
3. "B" DESIGNATES SHIELDING BEAD.

REV	DESCRIPTION	BY
—	3-25-82	R CLARK

MATL:

RF POWER LABS, INC.
WOODINVILLE, WASHINGTON

TOL:

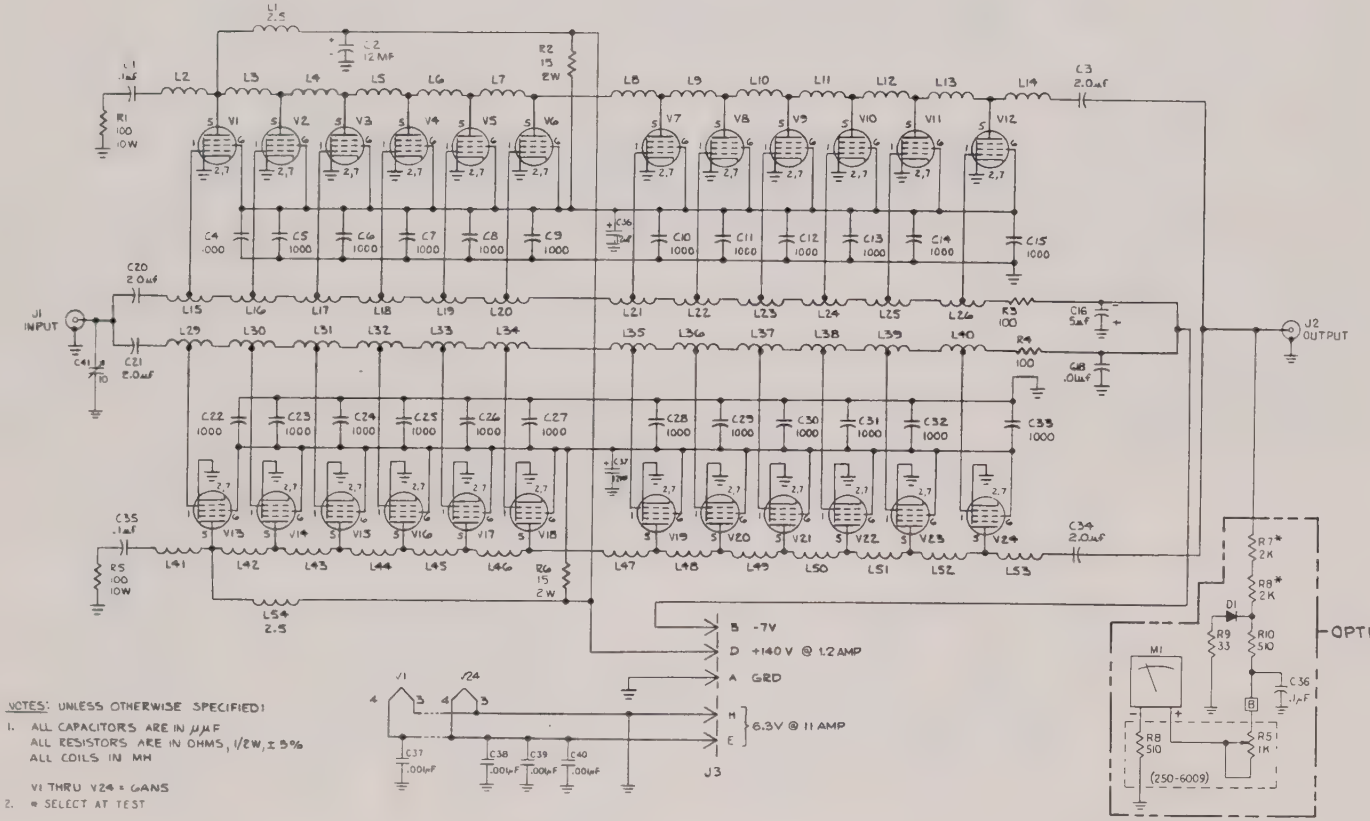
DRAWN:

CHECKED:

ENGR:

NAME: SCHEMATIC DIAGRAM DRIVER AMPLIFIER A-2 ASSY 250-10

DWG. NO.: 250-10-54



NOTES: UNLESS OTHERWISE SPECIFIED:

1. ALL CAPACITORS ARE IN μμF
   ALL RESISTORS ARE IN OHMS, 1/2W, ± 5%
   ALL COILS IN MH

   V1 THRU V24 = 6AN8

2. * SELECT AT TEST

REV	DESCRIPTION	BY
	7-13-84	DAL
	1-9-83	DAL
	11-19-82	DAL
-	3-25-82	R OAKES

MATL:

TOL:

RF POWER LABS, INC.
WOODINVILLE, WASHINGTON

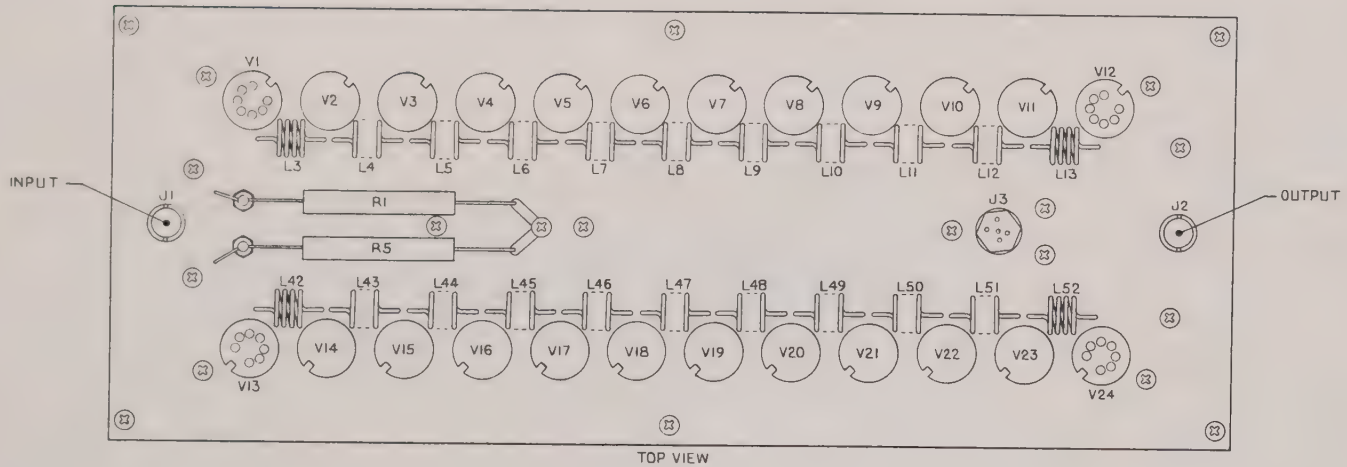
DRAWN: KP/GS

CHECKED

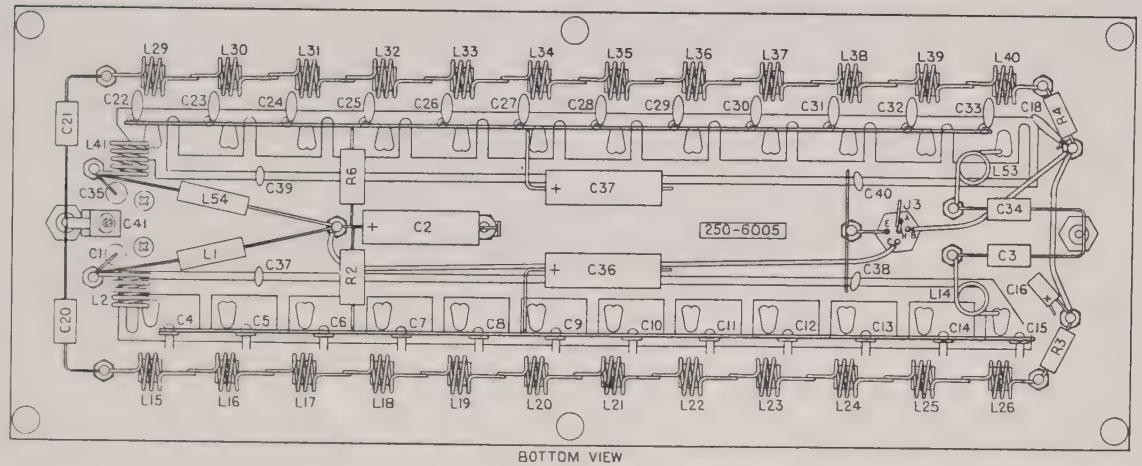
ENGR.

NAME: SCHEMATIC DIAGRAM OUTPUT STAGE A-3 ASSY 250-10

DWG. NO.: 250-10-S3



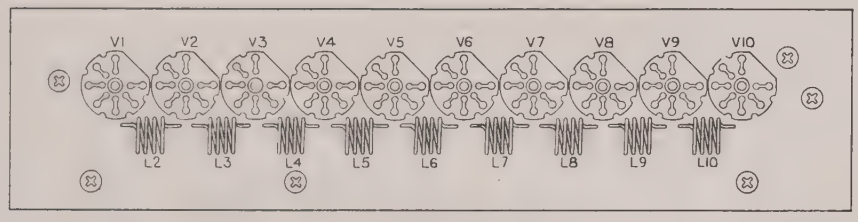
TOP VIEW



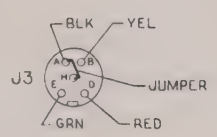
BOTTOM VIEW

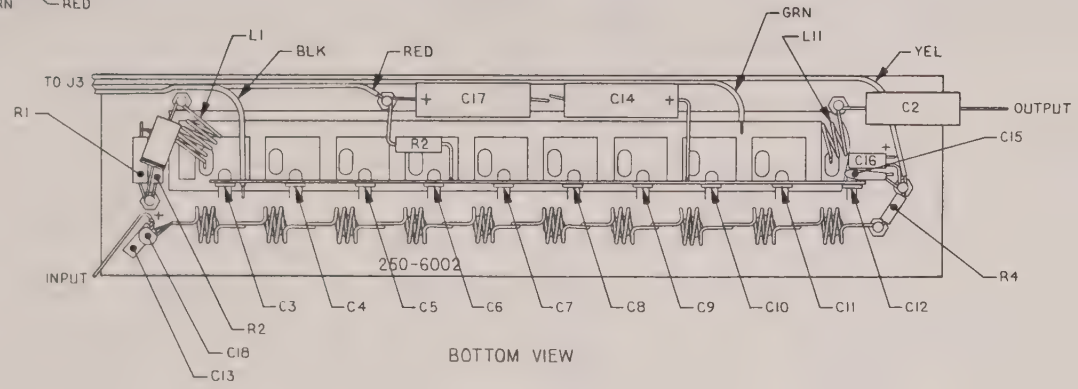
SCHEMATIC: 250-10 S3

RF POWER LABS, INC. WOODINVILLE, WASHINGTON		
SCALE 1/1	APPROVED BY:	DRAWN BY D A L
DATE 2-13-84		REVISED
PARTS LOCATION-OUTPUT STAGE, A3 ASSY		
250-8044	250-10	SIZE C



TOP VIEW

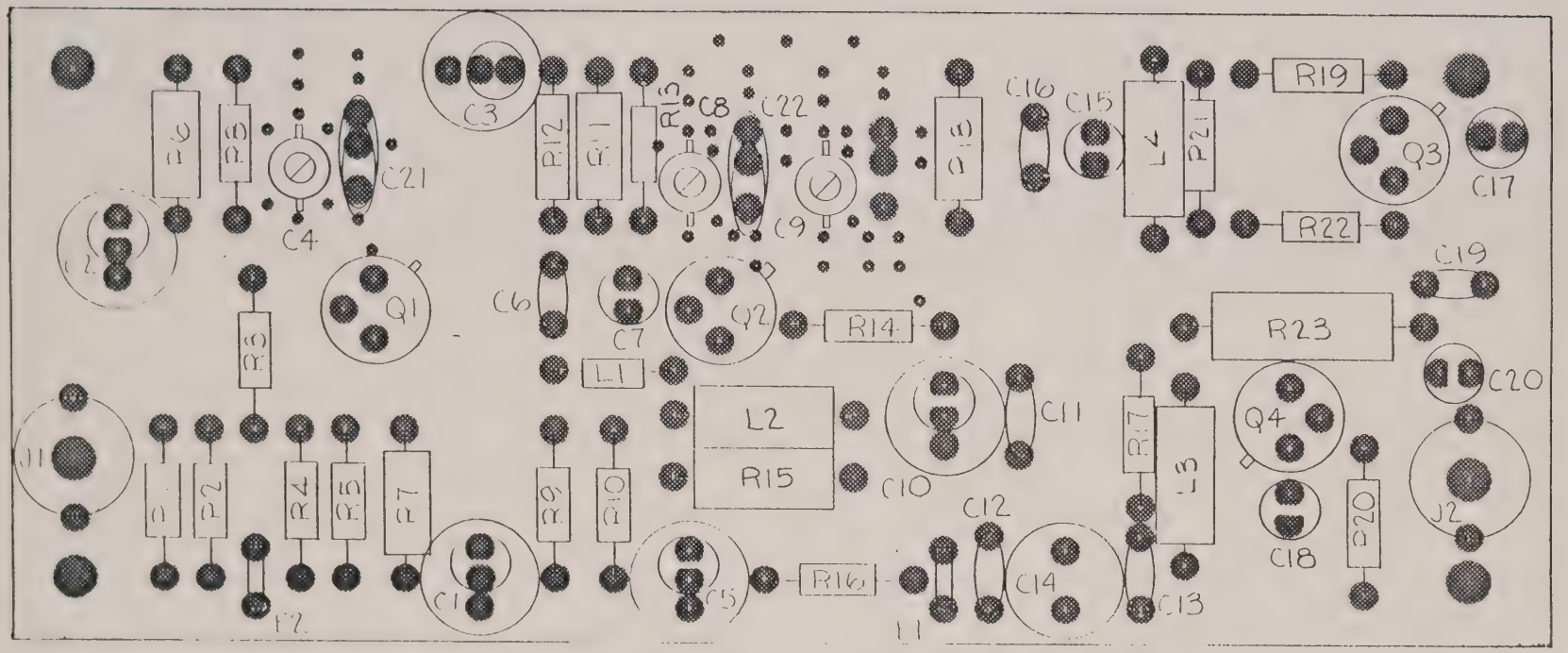




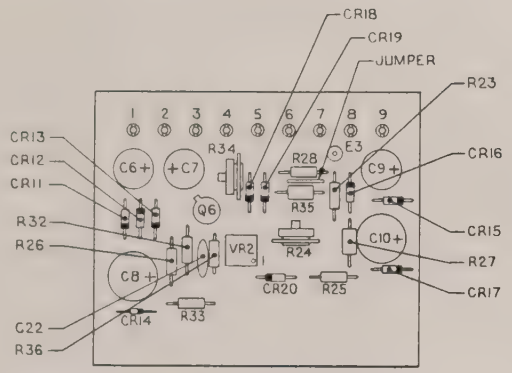
BOTTOM VIEW

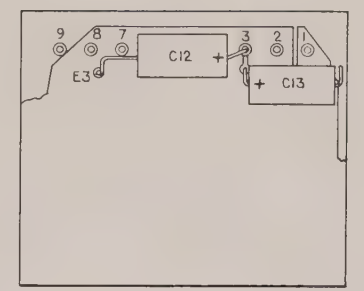
SCHEMATIC : 250-10 S4

RF POWER LABS, INC. WOODINVILLE, WASHINGTON		
SCALE 1/1	APPROVED BY:	DRAWN BY D A L
DATE 1-26-84		REVISED
PARTS LOCATION–DRIVER AMPLIFIER, A2 ASSY		
250-8041	250-10	SIZE C

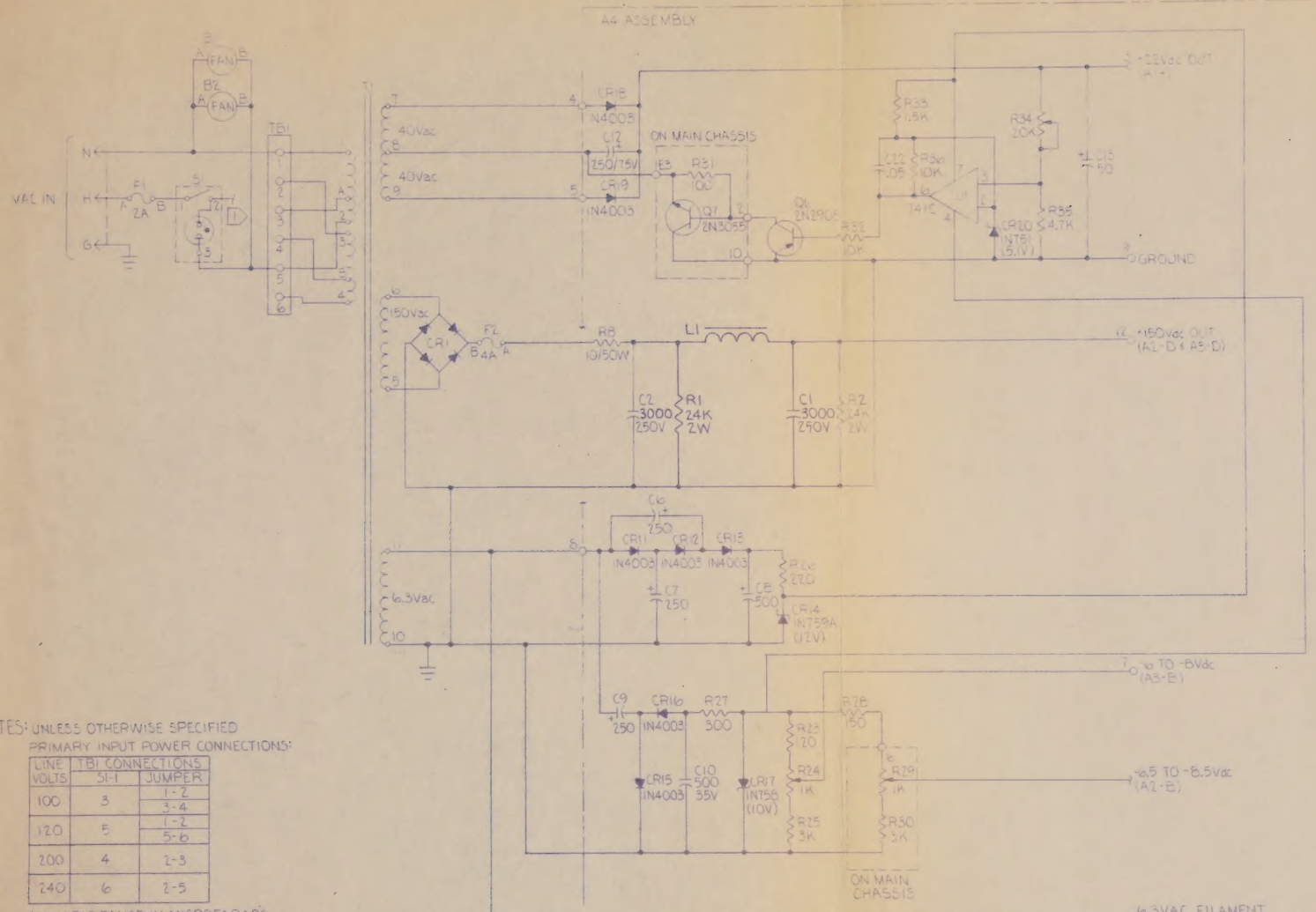


PREAMPLIFIER ASSEMBLY





RF POWER LABS, INC. WOODINVILLE, WASHINGTON		
SCALE 1/1	APPROVED BY:	DRAWN BY D A L
DATE 1-30-84		REVISED
PARTS LOCATION-POWER SUPPLY, A4 ASSY		
250-8042	250-10	SIZE C



NOTES: UNLESS OTHERWISE SPECIFIED

1. PRIMARY INPUT POWER CONNECTIONS:

LINE VOLTS	TB1 CONNECTIONS 51-1	JUMPER
100	3	1-2
		3-4
120	5	1-2
		5-6
200	4	2-3
240	6	2-5

2. ALL CAPACITANCE IN MICROFARADS.
3. ALL RESISTANCE IN OHMS.

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED

	250-10
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±

MATERIAL

FINISH

DO NOT SCALE DRAWING

CONTRACT NO.

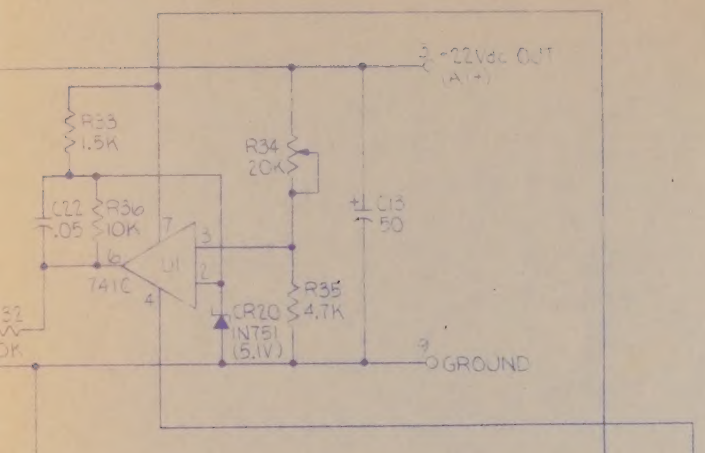
APPROVALS	DATE
DRAWN COLDNER	4-9-86
CHECKED	
ISSUED	12/11/86

RF Power Labs, Inc.
BOTHELL, WA. U.S.A.

TITLE: SCHEMATIC
250-10 POWER SUPPLY

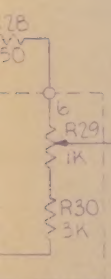
SIZE	FSCM NO.	DWG NO.	REV
D		7-38-315-02	
SCALE		SHEET	

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED



+150Vdc OUT
(A2-D & A3-D)

-6 TO -8Vdc
(A3-E)



-6.5 TO -8.5Vdc
(A2-B)

ON MAIN
CHASSIS

6.3VAC FILAMENT
(A2-C & A3-C)

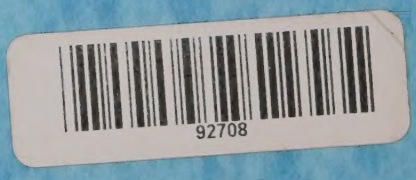
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES TOLERANCES ARE: FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±	CONTRACT NO.	RF Power Labs, Inc. BOTHELL, WA. U.S.A.	
		MATERIAL	APPROVALS / DRAWN GOLDNER	DATE 12-9-86	TITLE SCHEMATIC 250-10 POWER SUPPLY
	250-10	FINISH	CHECKED	12/11/86	SIZE D / FSCM NO. / DWG. NO. 7-85-515-00 / REV.
NEXT ASSY	USED ON		ISSUED		SCALE / SHEET
APPLICATION		DO NOT SCALE DRAWING			

ACCOPRESS®

25970	YELLOW
25971	BLACK
25972	LIGHT BLUE
25973	DARK BLUE
25974	LIGHT GRAY
25975	LIGHT GREEN
25976	DARK GREEN
25977	TANGERINE
25978	RED
25979	EXECUTIVE RED

GENUINE PRESSBOARD

ACCO INTERNATIONAL INC.
CHICAGO, ILLINOIS 60619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